

On the Megadactylus polyzelus of Hitchcock. By E. D. COPE.

This genus was named by Hitchcock in his 'Supplement to the Ichnology of New England,' p. 39, 1865; the bones have been briefly described in his 'Ichnology,' on p. 186. The remains were found, in a more or less fragmentary condition, in the red-sandstone rocks of the valley of the Connecticut, from the neighbourhood of Springfield, Massachusetts. They were found by William Smith, while engaged in superintending some excavations made at the armoury, which required blasting.

The remains consist of four caudal and one dorsal vertebræ, the greater part of the left fore foot, with distal portions of the ulna and radius, the greater part of the left femur, proximal end of left tibia, greater part of left fibula, tarsus, and hind foot, including a tarsal bone, perfect metatarsus, proximal end of a second metatarsus, parts of the distal end of a third, and parts and impressions of four phalanges.

These fragments demonstrate the former existence in the region in question of a typical form of the suborder or order Symphypoda (*Compsognatha*, Huxley), and one nearer the birds than any other hitherto found in America. Its pertinence to this order is shown by the absence of the first series of tarsal bones, apparently (as Gegenbaur has suggested, and as the structure of *Laelaps* proves) in consequence of their confluence with the distal extremities of the tibia and fibula. This important character is apparently assumed early in life in the present genus and in *Compsognathus*, and probably quite late in *Ornithotarsus*. In *Compsognathus* the additional peculiarity of the persistence of but two carpal bones is presented, which, according to Gegenbaur, should correspond with those of the first row of ordinary Reptilia, while those of the second have disappeared. In *Megadactylus* those of the first series are present, viz. the radial and probably ulnar, and one of the second row, very much reduced, opposite to the second metacarpus; there is space for a second one of the second series, but it does not appear in the matrix, while the ulnar is probably lost.

The bird-like tendencies of the Symphypoda have been indicated above; and the very ornithic character of the bones of the present form is also very marked. The walls of the long bones are very thin; in some places near their extremities almost as thin as writing-paper. The vertebræ and ischia present the same thin walls; the structure of these walls is exceedingly dense.

Prof. Cope next gives the special characters of the bones, which are here omitted. He adds:—

That animals of this genus made some of the tracks similar to those of birds in the red sandstones of the valley of the Connecticut there can be no doubt. It furthermore explains some problematical impressions which are occasionally found with them. Tracks of an animal resting in a plantigrade position, as indicated by the moulds of two long parallel metatarsi, each terminated by three toes, are accompanied by a peculiar, bilobate, transversely oval mark on the middle line, some distance behind the heels.

Prof. Hitchcock states that it appears to be the impression of a short stiff tail. The present specimen shows clearly that it was made by the obtuse extremities of the ischia. The saurian squatted down, resting on its styloid ischia as the third leg of a tripod, of which the anterior pair was represented by the hinder legs. Prof. O. C. Marsh informs me that in the museum of Yale College a slab exhibiting impressions similar to the above shows the impressions of the anterior feet also, which were put to the ground in the act of rising or sitting, or perhaps reached to it while the animal was squatting, as do those of carnivorous Mammalia.

The tracks of many of the animals discovered by Hitchcock are plantigrade. That they could not have walked like the plantigrade mammal is sufficiently evident from the length of the metatarsal elements, which would necessitate a constant contraction of the tibialis anticus muscle, or a peculiar arrangement of the tarsal bones for its support. The latter does not appear to have existed; and the former is so very improbable that, in connexion with the pneumatic structure of the bones, there is abundant reason to suppose that they progressed by leaps, and assumed the plantigrade position when at rest.

No portion of the cranium or dentition of this genus has been preserved. The large stout hooked claws of the fore foot would indicate a more or less carnivorous diet.

The existence of Symphyopoda in the strata here indicated, with the occurrence of a Pterosaurian in a similar situation in Pennsylvania, points to the existence of the transition from Keuper to Lias (that is, from Triassic to Jurassic beds) in the red sandstones of the eastern United States. They have been heretofore regarded as Triassic*, which the lower portions of them undoubtedly are, and similar to the German Keuper in the presence of Labyrinthodonts, Thecodonts, and Dinosauria in both Pennsylvania and N. Carolina.

The remains here described were alluded to by Prof. R. Owen as those of a Saurian pointing to the Pterodaelytes or Birds, provided the cavities of the bones were filled with marrow, and not with cartilage. Prof. Wyman regarded them as those of a reptile, though the long bones might have been referred to a bird, if considered alone. "While the bones from Springfield are as hollow as those of the Pterodaelyte, I do not find that they are those of this animal; there is no positive proof of the long fingers, nor of the broad sternum, which these reptiles possessed. The existence of the large toe in company with the small one is in favour of a jumping animal."—*From the Memoir of Prof. Cope on Extinct Reptilia and Aves, Amer. Phil. Soc., unpublished volume.*—*Silliman's American Journal*, May 1870.

* Hitchcock, in his 'Technology' (1858), holds that the beds containing the tracks are Lower Jurassic, either Oolitic or Lias; and Dana, in his 'Geology' (pp. 414, 443), says that the so-called Triassic is probably in part Jurassic.—*Eds. AM. JOURN. SCI.*